Environmental Protection Agency

Horiba Emission Analysis System NOx Efficiency Procedure

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NVFEL Reference Number

309

Implementation Approval

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Revision Description

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1. Purpose

The purpose of this procedure is to describe the equipment and procedure required to perform a N0x efficiency check using the Horiba Mexa 7000 Automotive Emission Analysis System.

2. Test Article Description

Horiba Mexa 7000 Automotive Emission Analysis System.

3. References

3.1 "Code of Federal Regulations," Title 40, Part 86, Subpart B, Sections 89.116, 86.119, and 86.123

3.2 Horiba "Automotive Emission Analysis System, Mexa-7000 User's Guide"

3.3 Environmental Protection Agency (EPA) current safety policies

3.4 "Horiba MEXA 7000 Series Training Manual"

4. Required Equipment

4.1 Horiba Mexa 7000 Automotive Emission Analysis System:

Equipment used:

Main Control Unit (MCU)

Interface Control Unit (IFC)

Analyzer Rack (ANR)

Solenoid Valve Unit (SVS)

Sample handling System (SHS)

Power Supply Unit (PSU)

Heated Analyzer (OVN)

Gas Divider (GDC)

Printer

4.2 Numbered flexible quick-disconnect jumper lines.

4.3 “NOx 100 ppm Span Gas” cylinder

5. Precautions

5.1 Cylinders containing compressed gases are used for this procedure. The technician must be familiar with the "EPA Laboratory Safety Manual" sections dealing with the safe handling, storage, and use of compressed gas cylinders.

Safety precautions must be followed when using compressed gases.

5.2 The Mexa 7000 Automotive Emission Analysis System must warm-up in the stand-by mode for a minimum of 2 hours after being fully powered up.

5.3 Exercise caution when operating heated units. Surface temperature may exceed 60 °C.

6. Visual Inspection

6.1 The test cell air handler should be on and test cell ambient conditions are stable.

6.2 The gas cylinder and equipment is checked for leakage, damage, and cleanliness.

6.3 The power is turned on for the analysis system and related equipment.

6.4 All documentation needed to operate the analysis system is present.

7. Test Article Preparation

7.1 Activate the Horiba Series 7000 Bench according to the Horiba "Series 7000 Users Guide." The Main Control Unit (MCU) computer monitor utilizes touch screen technology.

Note: If you have an internal gas divider, skip Steps 102 and 103.

7.2 Get the gas divider. Connect the communications cable and all gas lines from the divider to the bench and ensure that the divider is connected to a power outlet.

7.3 Connect the numbered flexible quick-disconnect jumper lines between the MEXA Analyzer Rack (ANR) Gas Divider Panel and the Solenoid Valve Selector (SVS) of the bench under test.

7.4 Turn the Gas Divider (GDC) power on. The switch is in the back of the unit. Let the divider warm up for at least 1 hour.

Line Number	Connection
1	Air
2	O_2
3	N_2
4	To GDC
5	From GDC

8. Test Procedure

The MCU computer monitor utilizes touch screen technology.

101 On the upper portion of the MCU display area, verify that "Dilute" displays in the field next to the "Line" button.

If not, touch the "Line" button. See the arrow in Figure 1.

Touch "Dilute" from the menu items that appear. See the circle in Figure 1.

Figure 1
Command Screen

102 From the Main Control Unit (MCU) "Command Screen," touch the Horiba logo in the title bar. See the arrow in Figure 2.

Touch "User Level" from the menu items that appear below the logo. See the circle in Figure 2.

Figure 2
User Level

103 If “Supervisor” is not the top menu item in the display window, touch “Supervisor.”

Use the mouse and on-screen keyboard to enter the password, then touch “Enter.” See Figure 3. “Supervisor” will appear at the top-center of the screen.

Figure 3
On-Screen Keyboard

104 On the display setup portion of the screen, touch the “Menu” button. See the arrow in Figure 4. From the menu items that appear, touch “Utility.”
See the circle in Figure 4.

Figure 4
Utility Selection

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105 At the bottom of the screen, touch the “Checks/Tests” button. See Figure 5. Touch “NOx Eff Check” from the menu items that appear.

Figure 5
Checks/Tests Button

106 On the “NOx efficiency Menu,” touch the “NOx Efficiency Check” button.

107 Under “NOx Analyzer Selection” on the “NOx efficiency Check” panel, verify that the data is correct. To make a correction for “Line”, “Comp”, or “Range”, do the following:

Touch the “Line” button. See the arrow in Figure 6. From the menu items that appear, touch "Dilute." See the circle in Figure 6.

Figure 6
Line Button

108 Touch the “Comp” button. See the arrow in Figure 7. Touch “NOx” from the menu items that appear. See the circle in Figure 7.

Figure 7
Comp Button

109 Touch the “Range” button. See the arrow in Figure 8. From the menu items that appear below the button, touch "100 ppm." See the circle in Figure 8.

Figure 8
Range Button

110 Touch the “Parameter Setup” button. See the arrow in Figure 9.

Figure 9
Parameter Setup Button

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111 On the “Parameter Setup” screen:

Verify that “Internal Gas to GDC” is selected next to the “Gas Supply” button. If not, touch the “Gas Supply” button. See the arrow in Figure 10. Touch “Internal Gas to GDC” from the menu items that appear. See the circle in Figure 10.

Figure 10
Internal Gas to GDC

112 Verify that “EPA” appears in the “Condition in ‘b’ ” display window. If it does not, touch the “Condition in ‘b’” button. See the arrow in Figure 11. Touch “EPA” from the menu items that appear. See the circle in Figure 11.

Figure 11
Condition in ‘b’ Window

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113 On the "Parameter Setup" menu, under the “Analyzer Specific Delay Times for A, a, b, c, d, B” heading, verify that "30" is in the yellow highlighted "Purge" field. See the circle in Figure 23. If not, touch in the field and use the on-screen keypad to enter the correct data. See Figure 12. On the keypad, touch the “OK” button.

Figure 12
Parameter Setup for Purge

114 On the "Parameter Setup" menu, under the “Analyzer Specific Delay Times for A, a, b, c, d, B” heading, verify that "60" is in the yellow highlighted "T1" field. See the circle in Figure 13.

If it is not, touch in the field and use the on-screen keypad to enter the correct data. See Figure 13. On the keypad, touch the “OK” button.

Figure 13
Parameter Setup for Tl

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115 On the "Parameter Setup" menu, under the “Analyzer Specific Delay Times for A, a, b, c, d, B” heading; the following fields cannot be changed. See Figure 14:

“T2” “T3”
“T4” “Tolerance”

Touch the “OK” button. See the arrow in Figure 14.

Figure 14
Parameter Setup Menu

116 When the “NOx efficiency Check” panel is displayed, verify that “Auto” appears in the “Mode” display window under the “Test Control” heading.

If it is not displayed, touch the “Mode” button. See the arrow in Figure 15. Touch “Auto” from the displayed menu items. See the circle in Figure 15.

Figure 15
Mode Display Window

117 Verify that “200” appears in the “Ozone Initial Count” display window.

If it is not displayed, touch in the yellow user changeable field next to the “Ozone Initial Count” heading. See the circle in Figure 16. Enter “200.” with the on-screen keypad. Touch “OK” to close the keypad. See Figure 16.

Figure 16
Ozone Initial Count Display Window

118 Verify that “20” appears in the “Ozone Step Count” display window.

If it is not displayed, touch in the yellow user changeable field next to the “Ozone Step Count” heading. See the circle in Figure 17. Enter “20.” with the on-screen keypad.

Touch “OK” to close the keypad. See Figure 17.

Figure 17
Ozone Step Count Display Window

119 Under “Test Control,” touch the “Start” button. See the arrow in Figure 18

Figure 18
Start Button

120 When the “Analyzer Calibration” panel appears, an automatic zero and span calibration of the analyzer will occur. The indicator flashes green during zero and flashes blue during span. See Figure 19.

If “Calibration failed” appears, touch the “Restart Cal” button. See arrow 1 in Figure 19.

When the zero and span calibration is completed, touch the “OK” button. See arrow 2 in Figure 19.

Figure 19
Analyzer Calibration Panel

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121 When the test begins, a subpanel will appear. It will display the “Reading Step X” (where X = 1 through 6) number in the upper left corner. See Figure 20

Note: The process can be stopped at any time by touching the “Cancel” button.

Figure 20
N0x Subpanel

122 When complete, the “Results” subpanel will automatically display “Pass” or “Fail” under the "Test Results" heading. See the circle in Figure 21.

If “Fail” is displayed, notify a PNGV senior technician and wait for instructions before proceeding.

If "Pass” is displayed, wait for the converter checker sequence to finish

Figure 21
Test Results Subpanel

123 Touch the Horiba logo button. See the arrow in Figure 22.

Touch “Hardcopy” from the menu items that appear below the logo. See the left-side circle in Figure 22. Then touch “Full screen” from the next menu. See the right-side circle in Figure 22. A hardcopy of the NOx efficiency test results will print on the control room printer. See the attachment.

Figure 22
Hardcopy Full screen

124 File the print-out in the diagnostics file.

125 Touch the “Cancel” button. See the arrow in Figure 23. The “NOx Efficiency Check" panel will appear.

Figure 23
Test Results

126 On the “NOx Efficiency Check" panel, touch the “Cancel” button. See the arrow in Figure 24.

Figure 24
NOx Efficiency Check Panel

127 Touch the “Menu” button. See the arrow in Figure 25. Then touch “Command” from the menu. See the circle in Figure 25.

Figure 25
Command Selection

128 Touch the “Horiba” logo. See the arrow in Figure 26. Touch" User Level" from the menu. See the circle in Figure 26. Touch "Normal" from the next menu.

Figure 26
User Level Selection

9. Data Input

9.1 On the NOx Efficiency Check menu, the operator selects 100 ppm concentration.

9.2 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” The operator enters "30" in the ""Purge" field, if necessary.

9.3 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” The operator enters "60" in the "T1" field, if necessary.

9.4 On the NOx Efficiency Check menu, the operator enters “200” in the “Ozone Initial Count” field, if necessary.

9.5 On the NOx Efficiency Check menu, the operator enters “20” in the “Ozone Step Count” field, if necessary.

10. Data Analysis

10.1 When the test is complete, the operator verifies that the “Results” subpanel automatically display the test results as “Pass.” If the results “Status” displays “Fail”, the operator notifies a senior technician

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11. Data Output

11.1 The operator prints a hardcopy of the NOx efficiency test results on the control room printer and files the print-out in the diagnostics file.

12. Acceptance Criteria

12.1 The correct data from the "Cylinder Site Assignment Program" sheet must be entered on the Span Gas Set screen.

12.2 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” the "Purge" field must contain "30."

12.3 On the "Parameter Setup" menu, under “Analyzer Specific Delay Times for A, a, b, c, d, B,” the "T1" field must contain "60.

12.4 “200” must appear in the “Ozone Initial Count” display window.

12.5 “20” must appear in the “Ozone Step Count” display window.

12.6 A zero and span calibration must be performed prior to the NOx efficiency check procedure.

12.7 The “NO2 Conc. Limit” shall not exceed 5% indicating "Pass" on the "Results" subpanel.

12.8 The “NOx Eff. Limit” shall be a minimum of 90% indicating "Pass" on the "Results" subpanel.

13. Quality Provisions

13.1 The technician checks to ensure all acceptance criteria (Section 12) have been met.

13.2 Prior to use, the Horiba "Automotive Emission Analysis System shall be warmed-up in the stand-by mode for a minimum of 2 hours after being fully powered up.

13.3 The divider must warm up for at least 1 hour before starting the procedure.

Attachment A
NOx Efficiency Check Report